and extraneous sources of heat must be avoided, and the furnaces made practically self-contained, if anything approaching perfection is to be attained. It must be upon simplicity, ease of working, and freedom from complicated parts that the progress of liquid fuel must chiefly depend.

"The direct pulverisation of the oil is now coming to be recognised as the proper method; it is the most efficient and the most economical."

The next two chapters are devoted to discussing the use of oil fuel for marine and naval purposes, but the division into two chapters is hardly needed, as the naval side of the question is scarcely touched upon, the bulk of the matter in that chapter being taken up with the trials of liquid fuel on the s.s. *Mariposa*, and the tests made on land by the American Liquid Fuel Navy Board.

The chapter on oil fuel in locomotives is an excellent summary of the work of Urquhart and Holden, whilst the use of oil fuel for metallurgical and domestic purposes also receives some attention.

The whole work compares very favourably indeed with the far more pretentious treatise on the subject which until now has been the only book of reference, and everyone interested in this important question will welcome Mr. North's excellent text-book.

THE DYNAMICS OF CHEMICAL CHANGE.

Chemical Statics and Dynamics. By J. W. Mellor, D.Sc. (N.Z.), B.Sc. (Vict.). Pp. xiii+538. (London: Longmans, Green, and Co.) Price 7*s.* 6*d.*

FOR some years past a marked increase of attention on the part of English chemists towards the rapidly developing physical chemistry has been observable. Until recently, however, the available English literature on the subject was confined to German translations, a state of things which is now being in a large measure remedied.

The present work forms one of the series of text-books of physical chemistry edited by Sir William Ramsay. According to the table of contents, four chapters are devoted to the consideration of homogeneous reactions, and in succeeding sections the initial periods in chemical change, heterogeneous reactions, equilibrium and dissociation, electrolytic dissociation, catalysis and the theory of chemical change, fermentation, the influence of temperature and pressure in chemical reactions, and finally explosions, are dealt with.

Since the appearance of van 't Hoff's "Etudes de Dynamique Chimique" a vast amount of work has been done in connection with the problems involved here, and the necessity for a summary of newly discovered facts, a criticism of recent theories, and an unbiased statement of our present position in regard to the dynamics of chemical change and allied problems must have been felt by many. Dr. Mellor's work will, therefore, receive an undoubted welcome.

The accumulated evidence on the nature of chemical change resulting from kinetic studies leads the author to favour the view that the "association" or "intermediate compound" theories describe in the most rational manner the mechanism of the majority of reactions. Simple consecutive changes determine the character of many apparently complex reactions.

In connection with the determination of the number of molecules taking part in reactions in gaseous systems the author sounds a very necessary warning note. The rate of decomposition of phosphine or arsine is a frequent text-book illustration of one of the methods employed, and the experimental data fit in with the assumption that the reaction is unimolecular and non-reversible. But there is another side to this and similar problems. It is not improbable that the reaction takes place on the surface of the walls of the containing vessel, and that its rate is conditioned solely by the rate of absorption of the gas by this surface. The course of the reaction will in this case also be that of a unimolecular change.

In the section on the measurement of chemical affinity we meet old and familiar friends in the illustrations of the thermal and density methods of comparing the affinities of two acids. The very moderate accuracy attainable in these methods, which involve the small difference between two experimental quantities, and in which corrections have frequently to be introduced in consequence of secondary changes, is scarcely ever sufficiently emphasised, and attention might have been directed to this point. A method depending upon the measurement of a property possessed by only one component of a system has obvious advantages, even if such methods are of limited application. Whether Thomsen's relative avidities and the relative ionic affinity coefficients are always identical conceptions is left for the reader to infer.

Chapter x., dealing with catalysis and the theory of chemical change, is most attractive reading. Here the processes of slow combustion or autoxidation are discussed in the light of the theories of Brodie, Schönbein, Clausius, van 't Hoff, Traube, Bach, Engler and Wild, and the interesting phenomena included under induced or sympathetic reactions are treated. In the chapter on explosions the account of older work is supplemented by many new and interesting facts.

In the reviewer's opinion Dr. Mellor's work is to be warmly recommended. The fact that it contains three thousand or so references to original papers is in itself evidence of its utility to the teacher, to the advanced student, and to the physical chemist engaged in research.

H. M. DAWSON.

RECENT EARTHQUAKES.

A Study of Recent Earthquakes. By Charles Davison, Sc.D., F.G.S. Pp. xii + 355; 80 illustrations. (London: Walter Scott Publishing Co., Ltd.) Price 6*s.*

IN this copiously illustrated volume Dr. Charles Davison, whose seismological investigations, especially those relating to British earthquakes, are so well known, gives a popular account of the results which have been arrived at by modern seismology. The method in which he treats his subject is one that appeals to the general reader. Rather than grouping

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seismic phenomena, as we should expect to find them in a text-book, the author has given a concise history of eight disturbances, each of which has a special interest. The Neapolitan earthquake is of interest from an historical point of view, the Ischian earthquakes illustrate the relationship between volcanic and seismic activities, a Japanese earthquake is described on account of the fault line which was produced at the time of its occurrence and the numerous after-shocks by which it was followed, whilst a British earthquake illustrates the growth of a fault. From the work of Robert Mallet upon the first of these earthquakes, which in 1857 devastated a district to the south-east of Naples, and when upwards of 9000 people lost their lives, the scientific world learned that out of ruins much might be learned respecting the direction and intensity of the movements which had caused them. Although his methods of investigation, as, for example, those relating to the determination of the depths of seismic foci, may have been modified by new observations, Mallet directed attention to new problems for the solution of which he employed scientific methods.

The Andalusian earthquake in 1884, we are told, is chiefly remarkable from the fact that it was recorded at very distant stations, as, for example, by magnetographs near Paris, at which city the movements of the ground could not be felt. For this disturbance the depth of its origin is determined by means of angles of emergence calculated from the directions of fractures in masonry walls. That the direction of these fractures might be due to the varying steepness of the earth waves which produced the shattering is not considered

The peculiarity of the Charleston earthquake is that it occurred in a region where such disturbances are almost unknown, that it had two foci about thirteen miles apart, and that it illustrated the behaviour of different races when confronted by a terrible disaster. With the negroes there was wild fear, panic, and a "selfish rush for safety." With Europeans in similar circumstances similar conditions prevail, but we are told that with Japanese there is calmness. Our own idea is that Japanese like to save their necks as well as other people. They will bolt at the time of an earthquake, to return, not with hysterical and shattered nerves, but chattering and laughing as if earthquakes were very fine jokes.

A subject attractive to the general reader which is referred to in several chapters is an account of signs which have given warning of a coming earthquake. Underground sounds have been heard, springs have varied in their flow, horses, birds, dogs, and even human beings have been restless for some time before great earthquakes. In his reference to the Riviera earthquake in 1887, Mr. Davison remarks that as premonitions were noted at 130 different places within the central area, "there can be little doubt that they were caused by microseismic movements for the most part insensible to man." In these days of psychical research we think that the author has lost an opportunity for romantic speculation.

Although the book is intended more for the person of ordinary intelligence than for the specialist, here and there we come upon information of an uncommon kind. For example, it is pointed out that the areas over which earthquake sounds are heard is variable in different countries. One reason for this is that the limits of audibility vary with different races. From illustrations given it would appear that for certain sounds the Anglo-Saxon ear is more acute than the Neapolitan, and very much more than that of the Japanese. This relationship between the physiological structure of the human ear and earthquake music is, to say the least, extremely interesting, but while discussing the same the fact must not be overlooked that in the same country districts may be found where seismic sounds are frequent, whilst there are other districts where Pluto shakes the ground but mutterings are never heard.

Dr. Davison's book is well worth reading, whilst the manner in which its contents have been arranged should obtain for it a circulation amongst those who seek for general information.

OUR BOOK SHELF.

A German-English Dictionary of Terms used in Medicine and the Allied Sciences. By Hugo Lang and B. Abrahams. Pp. vi + 598. (London: J. and A. Churchill, 1905.) Price 15*s.* net.

THERE is undoubtedly a vacant place which would be filled by a well-compiled work bearing the above title. The book now under review has a certain claim on our regard in this connection, and in some respects is a useful work. It purports to be, in the first place, a medical dictionary, and, so far as we can judge, fulfils this promise in a satisfactory manner. With a few minor blemishes there is a complete vocabulary of medical terms, and as a rule these are very fairly rendered by their English equivalents. But in the allied sciences, which are also supposed to be included, there are curious lacunæ. Chemistry is pretty well represented—for example, we found most of the technical terms in Biedermann's "Chemiker Kalendar" duly set down—but the pathological vocabulary leaves much to be desired, and apparently physiology is not considered an allied science at all—at any rate, physiological terms are very seldom to be met with.

The authors have generally avoided the pitfalls set for the unwary in works of this kind, and there are few actual mistakes; occasionally it is difficult to ascertain the real meaning of a word without extraneous assistance. For example, the word "typhus" by itself is not correctly translated by "typhus"; it invariably means "enteric" (typhoid), and the English typhus fever is "fleck-typhus," the latter being, however, correctly entered in its place. The medical meaning of "Belastung" is given; the completely different signification when the word is applied to muscle is omitted. But the cardinal fault of the dictionary is the treatment of compound words. These are separately set forth at length instead of being collected under their first components, and this increases the bulk and cost of the work (already too great) without conferring any real ease of reference. The courteous way in which the authors in the preface invite suggestions disarms too caustic comments, and we merely hint gently that in the next edition the space that could be saved by the course indicated could be profitably employed by the

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